

**QUALITY ASSURANCE PROGRAM PLAN
FOR THE LEAKING UNDERGROUND STORAGE TANK PROGRAM**

Office of Waste Management
Rhode Island Department of Environmental Management
Providence, Rhode Island

July 1999
(Revised November 2004)

TABLE OF CONTENTS

| | |
|--|---|
| 1. QUALITY ASSURANCE PROGRAM PLAN IDENTIFICATION FORM..... | 1 |
| <i>APPROVAL FOR AGENCIES</i> | 1 |
| <i>CONCURRENCES</i> | 1 |
| 2. INTRODUCTION..... | 2 |
| 3. QUALITY ASSURANCE POLICY STATEMENT | 2 |
| 3.1 Data Generation and General Quality Assurance | 3 |
| 3.2 Data Processing, Storage and Reduction | 3 |
| 3.3 Personnel and Management | 3 |
| 3.4 QA Implementation Committee..... | 4 |
| 3.5 QA Program Evaluation | 4 |
| 3.6 Guidance and Model Plans..... | 4 |
| 4. QUALITY ASSURANCE MANAGEMENT | 4 |
| 4.1 Assignment of Responsibilities..... | 5 |
| 4.1.1 Quality Assurance Officer (QAO) | 5 |
| 4.1.2 Other Responsible Parties..... | 5 |
| 4.2 Communication..... | 6 |
| 4.3 Program Assessment | 6 |
| 5. PERSONNEL QUALIFICATIONS | 6 |
| 5.1 Quality Assurance Personnel | 6 |
| 5.1.1 Quality Assurance Officer | 7 |
| 5.1.2 Other Personnel..... | 7 |
| 6. FACILITIES, EQUIPMENT, AND SERVICES | 7 |
| 7. DATA GENERATION/PROJECT PLANS..... | 8 |
| 8. DATA PROCESSING | 8 |

| | |
|--|----|
| 9. DATA QUALITY ASSESSMENT | 9 |
| 9.1 Accuracy | 9 |
| 9.2 Precision..... | 10 |
| 9.3 Completeness | 10 |
| 9.4 Representativeness..... | 10 |
| 9.5 Comparability | 11 |
| 10. CORRECTIVE ACTION | 11 |
| 11. IMPLEMENTATION REQUIREMENTS AND SCHEDULE | 12 |
| 12. DEFINITIONS | 12 |

APPENDICES

| | |
|---|----|
| A. Standard Operating Procedures Manual for Field Sampling (May 1992)..... | 14 |
| B. Lincoln Environmental Inc. – Quality Assurance and Quality Control Plan (May 2002) Fuss & O’Neill Inc. – Select Standard Operating Procedures (June 2002)..... | 14 |
| C. Environmental Science Services (ESS) Laboratory - Quality Plan (November 2000) Mitkem Corporation – Quality Assurance Plan (November 2001) R.I. Analytical Laboratories, Inc. – Quality Manual (September 2001) Premier Laboratory – Quality Manual (March 2002)..... | 14 |
| D. Leaking Underground Storage Tank Program (LUST) Guidance Document (RIDEM, October 2000)..... | 15 |
| E. UST Closure Assessment Guidelines (RIDEM, October 1998)..... | 39 |
| F. Standard Guide for Installation of Direct Push Ground Water Monitoring Wells, ASTM D6724-01 (January 2002)..... | 47 |
| G. Geoprobe Macro-Core Soil Sampler. Standard Operating Procedure. Technical Bulletin No. 95-8500 (Revised September 1998)..... | 47 |
| H. Geoprobe® 1.0 in. x 2.5 in. OD and 1.5-in. x 2,5-in. OD Prepacked Screen Monitoring Wells. Standard Operating Procedure. Technical Bulletin No. 992500 (Revised December 2002)..... | 47 |

1. QUALITY ASSURANCE PROGRAM PLAN IDENTIFICATION FORM

Document Title: Quality Assurance Program Plan
Leaking Underground Storage Tank (LUST) Program
Office of Waste Management (OWM)
Rhode Island Department of Environmental Management (RIDEM)

Address: 235 Promenade Street
Providence, RI 02908-5767

Telephone: (401) 222-2797

Plan Coverage: This Quality Assurance Plan covers all water and soil quality collection as well as analysis activities conducted by or regulated by the LUST Program at RIDEM.

APPROVAL FOR AGENCIES

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|---|---------------|
| _____ <i>Leo Hellested, P.E., Chief – Office of Waste Mgmt.</i> RI Dept. of Environmental Mgmt. | _____ Date |
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|---|---------------|
| _____ Kim E. Schweisberg, Project Officer OSSR, UST/LUST Team, USEPA Region I | _____ Date |
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CONCURRENCES

| | |
|--|---------------|
| _____ Sofia M. Kaczor, CPG-9393 Quality Assurance Officer, RIDEM | _____ Date |
|--|---------------|

| | |
|--|---------------|
| _____ Stephen DiMattei Quality Assurance Chemist, USEPA Region I | _____ Date |
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2. INTRODUCTION

The US EPA regulations regarding grants and federal assistance (40 CFR, Part 30) require the LUST Program at RIDEM to develop and implement a Quality Assurance (QA) Program Plan (§30.302 (d)). The QA Program Plan describes the management policies, procedures, specifications, standards and documentation to guarantee the reliability of the data as mandated in §30.503. The Plan will insure that water and soil data collection and analyses have followed the Department's Standard Operating Procedures and Quality Assurance/Quality Control (QA/QC) Plans of state and contract consultants and laboratories.

3. QUALITY ASSURANCE POLICY STATEMENT

It is the intent, and shall be the policy of the LUST Program to investigate all LUST sites in a consistent fashion, to ensure that the responsible party acts in an expeditious manner to perform the appropriate site assessment and, where circumstances dictate, designs a satisfactory remediation plan.

It shall be the policy to treat each LUST site on a case-by-case basis. The Project Manager assigned to the site ensures progress on legal and routine actions, and the Project Officer decides on the degree of remediation required based on several factors. The primary factor to be considered will be whether a direct threat to human health or the environment exists. Such cases will receive top priority, and direct action will be taken to protect the public. Where necessary at a minimum, free phase product removal will be required wherever encountered. In areas where groundwater is utilized for drinking, or on watersheds or recharge areas for public drinking water supplies, it shall be the goal of the LUST Program to clean the groundwater to drinking water standards as measured by the sampling of monitoring wells at the site perimeter (see "Rules and Regulations for Groundwater Quality", August 1996 and "Guidelines on the Management and Restoration of Groundwater in Urban Areas", May 1995). Compliance shall be defined as four successive quarterly samples meeting drinking water standards.

Treatment or removal of petroleum-contaminated soils will follow RIDEM's "Rules and Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials" (effective 22 October 2002), "Oil Pollution Control Regulations" (December 1990) and the "UST Closure Assessment Guidelines" (October 1998) as appropriate.

The policy of the LUST Program is and will be to collect water and soil quality data that is scientifically valid, defensible, and of known accuracy. The LUST Program presently uses the "Standard Operating Procedures Manual for Field Sampling" or SOP Manual (May 1992) to ensure that investigations are accurately conducted and defensible in an administrative proceeding (see Appendix A). Consultants retained by the Department to perform LUST investigations are required to submit a QA/QC plan and a specific Project Plan based on EPA QA/R-5 prior to engaging in site activities.

It shall be the policy of the Department to provide resources to allow for personnel involved in LUST investigations to receive training relating to groundwater contamination, corrective action technologies, and health and safety issues. A record of all the training classes taken by the

Office of Waste Management (OWM)'s staff is kept by Angela Shulman, the Asst. Administrative Officer for OWM.

3.1 Data Generation and General Quality Assurance

It is the intent of the LUST Program to ensure that sampling practices are the same for all persons performing investigations in order to ensure accurate, reproducible results. The general procedures for soil, groundwater, surface water, and other liquid sampling are outlined in the SOP Manual (see Appendix A). Lincoln Environmental and Fuss & O'Neill are RIDEM's contract consultants (see Appendix B). *In addition, the Department has started utilizing the services MACTEC Engineering and Consulting Inc. ("MACTEC") in the past year. The LUST Program contacts Lincoln Environmental, Fuss & O'Neill or MACTEC for investigation and remediation of LUST sites.* These consultants prepare a QA Project Plan based on EPA QA/R-5 and the LUST Program reviews it. A Principal Environmental Scientist reviews QA/QC Plans for RIDEM's contract Laboratories (see Appendix C.).

3.2 Data Processing, Storage and Reduction

The LUST Program Director assigns sites to Project Managers. The site Project Manager reviews data pertaining to a particular site. Based on review of the particular piece of data, any of several different actions may be appropriate and are discussed in detail in the LUST Guidance Document (Appendix D; RIDEM, October 2000). When review of the data is complete, the data shall be placed in the file maintained for each active LUST site investigation. Data regarded as significant, unusual, or otherwise noteworthy shall be passed on to the LUST Program Director for informational purposes or for further comment.

The process of release reporting at a UST facility to final closure of a LUST site is explained in the LUST Guidance Document. It is the responsibility of the Project Manager to consider and define, at the beginning or during the course of a project, the quality control and quality assurance activities needed to support a particular task. Appropriate management levels, in response to these needs, must allocate financial, personnel, time and other resources adequate to assure the successful initiation, continuance and complementation of the planned task.

3.3 Personnel and Management

To implement this QA Program Plan, it is necessary to establish a suitable and effective management structure. Those management and support personnel involved with QA concerns should be qualified, by training and/or expertise, to assume the necessary responsibilities. When appropriate, training and experience related to QA can be sought through such mechanisms as individual study, enrollment in short courses or attendance at technical meetings or conferences addressing QA topics. The successful implementation of a QA Program Plan involves a large educational component and cannot be accomplished in a brief time period.

The QA management structure in the state will be as follows:

- a) The Chief of the Office of Waste Management has overall responsibility for implementation of the LUST Program and the appointment of QAOs.
- b) QAOs will deal with QA matters within and will provide necessary liaison with the Regional Office to help ensure that LUST-QA Program requirements are met within the state. The Position Description of the appointed QAO will be revised as necessary to reflect the inclusion of QA responsibilities among his/her total duties.
- c) The Chief will make a formal commitment of time and resources necessary to ensure that data are precise and accurate and as complete and representative as required.

3.4 QA Implementation Committee

The QAO, Project Managers and any other participant in the LUST-QA Program will constitute the Implementation Committee to facilitate communication of QA needs, the resolution of any QA needs, the resolution of any QA problems and, generally, to implement the provisions of the QA Program Plan.

3.5 QA Program Evaluation

The QA Program Plan will be reviewed as needed by the QA Implementation Committee under direction of the LUST Program QAO. The Program Plan will then be revised or updated, as necessary.

3.6 Guidance and Model Plans

The Office of Underground Storage Tanks (OUST) offices in the EPA Regions and Headquarters will provide guidance specific to the LUST Program. This will be done in order to assist the state in staying abreast to national developments.

4. QUALITY ASSURANCE MANAGEMENT

The purpose of the LUST Program is to protect public and private groundwater sources of drinking water from petroleum contamination due to leaking underground storage tanks. The funding for the program is derived from a federal gasoline tax, passed on to the states through the EPA. The intent of the fund is to actively clean sites, give relief to affected homeowners, and recover the monies. To this end, Rhode Island has targeted \$600,000 per year for the maintenance of a core program staff to investigate suspected LUST sites, to initiate enforcement actions against the owner, and secure a Consent Agreement whereby the owner or other responsible party undertakes an acceptable Corrective Action Plan.

The LUST Program Director, *Bruce T. Catterall, P.E.*, has retired and the Department is in the process of filling this position. For purposes of this program, he will direct the staff engaged in

LUST investigations. The management of the quality assurance program for the LUST Program has been assigned to Sofia M. Kaczor (QAO). An organizational chart for the LUST Program within the Office of Waste Management is shown on Figure 1.

4.1 Assignment of Responsibilities

4.1.1 Quality Assurance Officer (QAO)

The responsibilities of the QAO include:

- Serves as the official state point of contact with EPA for all QA-related matters, which are pertinent to the LUST Program.
- Maintains close contact with the regional QA officers and award officials.
- Presides over the LUST-QA Implementation Committee in the state. Works with this committee in preparing and revising the QA Program Plan for the LUST Program and toward the development and implementation of a mechanism for corrective action when deficiencies are found in important QA activities.
- Ensures that corrective actions, such as letters, site visits and telephone calls, occur as effectively as possible.
- Identifies particular QA needs and resolves problems within the State LUST Program.
- Reviews and approves the State's LUST Program QA Project Plans and revisions generated within this program.

Additional responsibilities of the QAO are to:

- ensure that data from outside sources needed for in-house projects are properly reviewed for quality assurance purposes; and,
- respond to requests for guidance or assistance from project officers involved in activities, which encompass the generation of data from environmental measurements.

4.1.2 Other Responsible Parties

The Chief of the Office of Waste Management and the LUST Program Director will bear responsibility for QA/QC within the LUST Program. A Senior Environmental Scientist at RIDEM will assist in all aspects of the QA Program.

4.2 Communication

The QA officer will maintain all files and reports describing the QA activities within the LUST Program. Private laboratories will be required to maintain their own files and reports describing these respective QA activities.

The award official for all LUST Program grants, cooperative agreements, contract and interagency agreements should communicate to the appropriate QAO significant developments in defining the quality assurance needs. Guidance and information of particular value to QAO's is available in the following documents:

“EPA Requirements for Quality Management Plans”, Interim Final, August 1994, EPA QA/R-2

“EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations”, Draft Interim Final, August 1994, EPA QA/R-5

4.3 Program Assessment

Effective management of the QA program requires periodic assessments to identify and correct any deficiencies or problems. To monitor adherence to the QA Program Plan, the QAO shall:

- review QA Project Plans to make sure that up-to-date QA/QC activities or requirements are included; and when necessary, recruit the help of other LUST Program personnel to properly assess the QA Program;
- participate in system audits which consist of a review of the total data production which includes on-site reviews of a field and laboratory's operational systems and physical facilities for sampling, calibration and measurement protocol; and
- participate in performance audits, which independently collect measurement data using performance evaluation samples.

5. PERSONNEL QUALIFICATIONS

All state personnel involved in the collection and analyses of water or soil samples shall meet the minimum education and experience requirements for their position as specified by the RIDEM's Personnel Office. The QAO shall have adequate knowledge of sampling and analytical procedures and statistical analysis techniques to carry out an effective QA program.

5.1 Quality Assurance Personnel

Most personnel with QA responsibilities within the state have acquired their QA experience through on-the-job training. Those designated to serve in the program have a technical (scientific, engineering) background that includes previous experience with QA concepts and with evaluation of data generated from environmental measurements. Management within the State's LUST Program encourages and supports the acquisition by personnel with quality assurance experience or pertinent experience and information. This is done through:

- participation in QA-related EPA seminars;
- attendance at appropriate professional meetings, conferences or workshops;
- enrollment in appropriate short courses.

5.1.1 Quality Assurance Officer

The QAO for the state LUST Program meets the following qualification:

Senior Environmental Scientist

5.1.2 Other Personnel

Other personnel categories involved in the LUST-QA Program are:

Principal Environmental Scientist (1)

Principal Sanitary Engineer (1)

Senior Environmental Scientist (2)

6. FACILITIES, EQUIPMENT, AND SERVICES

The EPA has developed guidelines, which describe the minimum requirements of facilities, equipment, and personnel that a laboratory must meet to conduct chemical, microbiological or radiochemical analyses of water for compliance monitoring. These guidelines (Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supplies; publication 600/8-78-017, dated August 1978), and contemplated subsequent revisions, are generally applicable to laboratories supplying environmental measurement data to the State. Specific, anticipated personnel, facilities and equipment requirements that must be met by a performing laboratory are part of the Project Plan approved by the QAO.

All other environmental measurements, which are not classified as water quality measurements, and that are also part of the LUST Program-QA will also have to be collected and analyzed in accordance with QA requirements. Equipment necessary for these measurements must be adequate and the project officers and QAO must be knowledgeable of their capabilities.

Facilities include:

- a) RIDEM/OWM contract laboratories. The contract laboratories are selected annually through the State vendor bidding process (and renewable for two more years) and as part of the bidding process the lab must provide documentation stating they can meet all of the RIDEM/OWM needs and QA/QC requirements;
- b) RIDEM/OWM contract consultants. Their QA/QC Plan and Select SOPs are included in Appendix B.

Prior to RIDEM/OWM awarding a contract to a laboratory it must submit a package, which describes the laboratory and its procedures and capabilities. This package must include specific methods and detection limits. Also, the laboratory must submit the SOPs for review and approval.

Laboratory facilities shall be adequate to perform the necessary analysis and the laboratory shall be provided with the proper services to maintain satisfactory lighting, temperature, humidity, ventilation and safety.

Equipment for groundwater investigations currently being used include two HNU Photoionization Detectors (Model HW-101), two HNU Photoionization Detectors (Model PI-101), a flame ionization detector (OVM Model 580s/dx1), two ORS interface probes (100 feet), a high flow submersible sampling pump (Grundfos), a metal detector (Schonstead), and Theodolite and Level surveying equipment. The LUST Program recently acquired a laptop computer (Dell Latitude C810), three low flow sampling pumps (Whale), two peristaltic sampling pumps (Redi-Flo), and a generator. *The Department has acquired a Geoprobe in the past year. Select SOPs are included in Appendices F, G and H.* With the equipment and expertise in house, basic investigations can be accomplished. All equipment shall be routinely maintained and calibrated according to the service and instruction manuals. Maintenance documentation is kept with the equipment.

7. DATA GENERATION/PROJECT PLANS

Data generated for the LUST Program is supplied by the contract laboratories.

A SOP Manual has been prepared for the LUST Program (see Appendix A). A QA/QC Plan for Lincoln Environmental and Select SOPs for Fuss & O'Neill, have been prepared (see Appendix B). Lincoln Environmental and Fuss & O'Neill generate QA Project Plans, which are reviewed by the Project Manager, LUST Program Director and QAO in the LUST Program. QA Project Plans for all water and soil quality monitoring activities have been prepared by the four contract laboratories (see Appendix C).

8. DATA PROCESSING

Data processing includes collection, validation, storage, transfer and reduction and is discussed in the Project Plans. Adequate precautions must be taken during these steps to prevent the introduction of errors or the loss of data.

9. DATA QUALITY ASSESSMENT

Data are evaluated primarily from the standpoint of consistency with the situation, using the expertise and experience gained from past investigations. The site Project Manager should evaluate all data for accuracy, validity and defensibility within the context of the overall investigation. Hydrogeology, surface topography, and the physical location of the site should be taken into account when evaluating data. Where appropriate, data verification is employed. Repeat measurements, check samples and "split" samples are all measures, which are employed to ensure that the data being evaluated is accurate.

The evaluation of data with respect to a site is always performed with an eye to the history or the future of the particular case, whether preliminary (part of a site assessment or subsurface investigation) or advanced remediation effectiveness evaluation. Data are procured in response to a question (Is a site contaminated? To what extent? Is a remediation system working effectively? Has a site been cleaned to a satisfactory level? Are further or different measures appropriate?). Data are evaluated, along with previous data, to answer or partially answer the questions being asked. The most important factor in the evaluation of most data (such as groundwater levels and analytical results) is the fact that they are generally a "snapshot in time" for a site. It is important not to attach excessive significance to data, which may turn out to be merely a short-term fluctuation. Groundwater is a slow moving medium, and long term monitoring is usually required before definite contamination plumes can be defined. However, employing professional judgement in the evaluation of preliminary data can reduce the investigation period substantially.

The quality of all environmental data generated and processed will be assessed for accuracy, precision, completeness, representativeness and comparability (see Section 12. Definitions). The data user should ensure that the quality of the data to be used meets the minimum requirements expressed in the study design. The particular approach to be followed for data assessment must be addressed in all QA Project Plans.

Aspects of data quality, which will be addressed, are:

9.1 Accuracy

Each QA Project Plan shall contain a mechanism for demonstrating the degree of agreement of a measurement with the accepted reference or true value. Reference materials or quality control samples may be analyzed alongside routine samples and the results used to check the accuracy of analytical procedures. Many such quality control samples for chemical, physical and biological measurements are available from the EPA Environmental Monitoring and Support Laboratory or Environmental Monitoring Systems Laboratory. The ability of a laboratory to perform an accurate analysis can be checked through the results from performance evaluation samples, many of which are also available from EPA. Items that should be considered when assessing accuracy include:

- All calculations of precision and accuracy must accompany all data.

- Means to avoid sample contamination during collection, storage and handling.
- Steps to assure proper sample preservation.
- Acceptable analytical methodology or alternate methodology (EPA-approved whenever possible)
- Acceptable results of instrument quality control checks (defined variables must be within predetermined acceptance limits).
- Acceptable-recoveries, to be determined through the use of reference or spiked samples.
- Appropriate use of experimental control or control groups.

9.2 Precision

Each QA Project Plan should contain a description of the means to be used to determine reproducibility or precision of the analytical results or experimental measurements. If this is judged to be unnecessary or not possible, an explanatory statement should be provided in the Project Plan.

Aspects of precision and reproducibility that should be addressed include:

- Replicate or duplicate samples - a minimum frequency of replicate sample collection and analysis should be stated and data shall be within predetermined acceptance levels.
- Split samples - analyses of a single sample sent to at least two different laboratories are useful for establishing interlaboratory precision.
- Instrumental quality control checks (see 9.1).

9.3 Completeness

For projects where it is relevant, the QA Project Plan will identify the minimum quantity of valid data needed to meet the needs of the project (i.e., the minimum quantity of data with acceptable precision and accuracy). Trade-offs may be necessary in some situations between the amount of data collected and the quality of the data.

9.4 Representative ness

Each QA Project Plan should address the question of whether analytical sampling addresses the goal of characterizing the petroleum release. The means for accomplishing the sampling goals are to be explained along with how to ensure that the samples collected will be representative of the release at the site.

9.5 Comparability

Each QA Project Plan should contain procedures to assure the comparability of data. Examples are:

- consistency of units of measurement;
- standardized data format;
- standardized siting, sampling, and analysis (where applicable) using EPA and RIDEM – approved methods (Closure Assessment Guidelines, October 1998).

10. CORRECTIVE ACTION

The project plan will include provisions for corrective action when problems develop that affect the quality of the data or when the data does not conform to the required accuracy. The responsibility for the various field and laboratory personnel will be outlined and the corrective action or communication necessary will be described. Results from the QA activities may initiate corrective action:

- a) Performance audits
- b) Systems audits
- c) Interlaboratory or interfield comparison studies
- d) Failure to adhere to approved QA Program Plans, QA Project Plans or to SOP's
- e) Justifiable peer criticism

The Project Officer or LUST Program Director has responsibility to determine:

- a) whether corrective actions are necessary or justified
- b) who is responsible for taking corrective action
- c) when corrective actions are to be taken
- d) how and to whom the results of corrective actions are to be reported and documented.

11. IMPLEMENTATION REQUIREMENTS AND SCHEDULE

Many of the elements of the program plans, SOPs and QA project plans have been implemented and are being followed. This QA Program Plan will be implemented by RIDEM once USEPA has given its approval.

12. DEFINITIONS

Accuracy - The degree of agreement of measurement (or an average of measurements of the same thing), X, with an accepted reference or true value, T, usually expressed as the absolute difference between the two values, $|X-T|$, or the difference as a percentage of true value, $(100) \frac{|X-T|}{T}$.

T

Comparability - A measure of the confidence with which one data set can be compared to another data set of the same property.

Completeness - A measure of the amount of valid data obtained from a measurement activity compared to the amount that was initially expected to be collected to adequately meet the goals of a project.

Data Validation - The process whereby data are accepted or rejected based on a set of criteria. Criteria for data validation shall be specified in each QA Project Plan. Explanations or causes should be sought for data determined to be invalid. Where persistent problems are identified, that affect the goals of the study, appropriate corrective action should be taken.

Environmental Measurements - The term "environmental measurements" applies to essentially all field and laboratory investigations that generate data involving the measurement of chemical, physical, or biological (radiological?) parameters in the environment. Some specific examples are: determining the presence of pollutants in drinking, ambient and waste waters; health and ecological effect studies; clinical and epidemiological investigations; engineering and process evaluations; studies involving laboratory simulation of environmental events; and studies or measurements on pollutant transport phenomena.

LUST Program Director - Person with the main responsibility of the LUST Program in the state.

Precision - A measure of mutual agreement among individual measurements of the same property, obtained under prescribed, similar conditions.

Project Manager - Person in the state LUST Program responsible for routine management and oversight of a particular LUST site.

Quality Assurance - The total integrated program, which contains the quality planning, quality assessment and quality improvement efforts of various groups within an organization for assuring the validity and the reliability of environmental data to meet the user's defined

requirements.

Quality Control - The routine application of procedures for obtaining prescribed standards of performance for a specific measurement activity.

QA Officer (QAO) - Person in the state responsible for the QA program. The QA officer is also the main liaison with EPA and approves QA project plans.

QA Program Plan - A written document, which presents, in general terms, the overall policies, organization, objectives, and functional responsibilities designed to achieve data quality goals for all the activities requiring environmental measurements within an organization.

QA Project Plan - A written document for a specified project, which details the policies, organization, objectives, functional activities, and specific QA and quality control (QC) activities designed to achieve data quality goals or requirements. The QA project plan will address such data needs as precision, accuracy, completeness and representativeness and, where appropriate, the comparability of data sets.

QA Performance Audit - A **quantitative** analysis or check with a reference material or device with known properties or characteristics. Such audits are performed periodically to determine the accuracy of a measurement system. As an example, some performance audits may require the identification and/or quantification of specific chemical elements or compounds.

QA System Audit - A systematic on-site **qualitative** review of facilities, equipment, training procedures, record keeping, data validation, data management, and reporting aspects of a total (QA) system. This may be required to assess the capability of a system, to generate data of the required quality prior to awarding a contract or grant or to determine compliance of an awardee with the QA requirements of the contract or grant.

Representativeness - The degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or an environmental condition.

Standard Operating Procedure - A written document which details a procedure or action in a stepwise manner and which is commonly accepted as a valid method for performing certain routine or repetitive tasks.

(Electronic copies of these appendices are not available.)

APPENDIX A

Standard Operating Procedures Manual for Field Sampling (May 1992)

APPENDIX B

Lincoln Environmental Inc. – Quality Assurance and Quality Control Plan (May 2002)

Fuss & O'Neill Inc. – Select Standard Operating Procedures (June 2002)

APPENDIX C

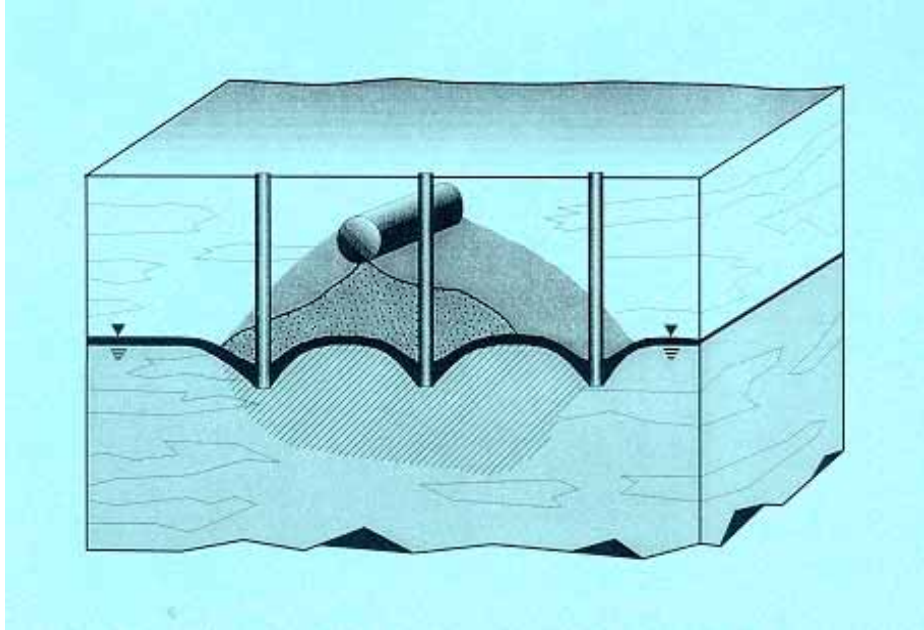
Environmental Science Services (ESS) Laboratory - Quality Plan (November 2000)

Mitkem Corporation – Quality Assurance Plan (November 2001)

R.I. Analytical Laboratories, Inc. – Quality Manual (September 2001)

Premier Laboratory – Quality Manual (March 2002)

APPENDIX D
LEAKING UNDERGROUND STORAGE TANK PROGRAM
GUIDANCE DOCUMENT



STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WASTE MANGEMENT
UNDERGROUND STORAGE TANK MANAGEMENT PROGRAM

October 2000

TABLE OF CONTENTS

| | |
|---|----|
| 1.0 General Petroleum or Hazardous Material Release Reporting..... | 18 |
| 1.1 Release Reporting from Underground Storage Tanks | 18 |
| 1.2 Groundwater Dissolved Phase Contamination..... | 18 |
| 1.3 Soil Contamination | 18 |
| 1.4 Failed Tank Tightness Tests..... | 19 |
| 2.0 Department Response to release report | 19 |
| 2.1 Initial Abatement Action or Other Emergency Procedures | 19 |
| 2.2 Release Characterization Report..... | 19 |
| 2.3 Waiver of Site Investigation Report..... | 20 |
| 3.0 Underground Storage Tank Closure | 20 |
| 3.1 UST Closure Application | 20 |
| 3.2 UST Closure Application Review and Approval | 20 |
| 3.3 Closure Assessment..... | 21 |
| 3.4 Closure in Place | 21 |
| 3.5 Scheduling..... | 22 |
| 3.6 Additional actions which may be required during the tank closure | 22 |
| 3.7 Soil Excavation During Tank Closure | 23 |
| 3.8 Contaminated Soil Management..... | 23 |
| 3.9 Underground Storage Tank Closure Assessments Reports | 24 |
| 4.0 Site Investigation Report (SIR)..... | 25 |
| 4.1 Definition | 25 |
| 4.2 Purpose..... | 26 |
| 4.3 Determination to require a SIR | 26 |
| 4.4 Deadline for Submission of a SIR..... | 26 |
| 4.5 Required Information | 26 |
| 4.6 SIR Review | 27 |
| 5.0 Actions That May Be Taken After the SIR Review | 27 |
| 5.1 Issuance of a no Further Action Letter | 27 |
| 5.2 Further Action is Required | 27 |
| 5.2.1 Petroleum Contamination of Groundwater is Limited in Degree and Extent | 27 |
| 5.2.2 Petroleum Contamination of Groundwater is Severe in Degree and Extent | 28 |
| 6.0 Corrective Action Plan (CAP) | 28 |
| 6.1 Submittal | 28 |
| 6.2 Contents of CAP | 29 |
| 6.3 Corrective Actions..... | 30 |
| 6.4 Review of CAP | 30 |
| 6.5 Approval of CAP | 30 |
| 6.6 Implementation of CAP..... | 31 |
| 7.0 Clean-Up Criteria (Remedial Objectives) | 31 |

| | |
|-------------------------------------|----|
| 8.0 Site Closure..... | 32 |
| 8.1 Compliance Determination | 32 |
| 8.2 Risk-Based Decision Making..... | 33 |
| 8.3 No Further Action..... | 35 |
| 9.0 Enforcement..... | 35 |
| 9.1 Informal Enforcement | 35 |
| 9.2 Formal Enforcement..... | 36 |

APPENDICES (Electronic Copies are not available for these Appendices I & III)

| | |
|---|----|
| APPENDIX I – UST Closure Assessment Guidelines (DEM, October 1998) (Appendix E | 39 |
| APPENDIX II – Permanent Closure Application for Underground Storage Tank(s)..... | 37 |
| APPENDIX III – Closure in Place (CIP) Policy (RIDEM, June 1998)..... | 37 |
| APPENDIX IV – Natural Attenuation..... | 38 |

1.0 General Petroleum or Hazardous Material Release Reporting

Any person having actual knowledge of a confirmed or suspected release of petroleum product or hazardous material from any source should immediately (within the same day) report the release to the DEM at (401) 222-3070 and the local fire official.

1.1 Release Reporting from Underground Storage Tanks

The “Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials” (DEM, December 1993 or subsequent revisions) or **UST Regulations** require that all confirmed or suspected releases of product from USTs be reported to the Department in accordance with section 14.04. The **UST Regulations** do not exempt any UST Facility used to store petroleum products and hazardous materials from release reporting requirements.

Typically, suspected UST releases are reported to the UST Management Program by the owner/operator, consultant, tank tester, DEM personnel, or third parties. The release reports may initially come in the form of:

- Emergency response reports from DEM's emergency response staff
- UST inspections during tank closures
- Failed tank tightness tests
- Site assessments (conducted for requirements other than those required in the **UST Regulations** such as real estate transfers, financial institutions' requisites, etc.)

1.2 Groundwater Dissolved Phase Contamination

Discoveries of dissolved phase contamination should be reported if the concentrations exceed the preventative action limits tabulated in Section 10 of the “Rules and Regulations for Groundwater Quality” (DEM, amended July 1993 or subsequent revisions) or **Groundwater Regulations**, for groundwater areas with the GAA or GA designation. Discoveries of dissolved phase contamination in areas with groundwater designated, as GB must be reported if the contaminant concentration exceeds Table 1 of the RIDEM Policy Memo 95-02 entitled "Guidelines on the Management and Restoration of Groundwater in Urban Areas" (May 31, 1995) or **Urban Groundwater Policy**.

1.3 Soil Contamination

Releases discovered through laboratory analysis of soil samples must be reported if the contaminant concentrations exceed the values listed in Table 2, “Leachability Criteria” of the *UST Closure Assessment Guidelines* (DEM, October 1998 or subsequent revisions) (see Appendix I).

1.4 Failed Tank Tightness Tests

In the case of a failed tank tightness test, it is also the responsibility of the tank tester to report the failed tank tightness test within two (2) hours.

2.0 Department Response to release report

Upon the receipt of a release report, DEM personnel will make an immediate response in cases where it is decided that there is an immediate threat to human health or the environment.

Otherwise, when a suspected or confirmed release from a UST is reported to the DEM, the UST Program assigns a project manager to respond to the release. The UST project manager reviews the report, additional information is solicited if needed, and an effort is made to identify the responsible party so that any initial abatement and all other required actions can be initiated.

2.1 Initial Abatement Action or Other Emergency Procedures

Section 14.05 of the **UST Regulations** details the required initial abatement actions to be taken by the owner/operator (or representative) in response to a release from a UST. The DEM may with its own staff and/or hired contractors perform the necessary initial abatement actions in cases where an owner/operator can not immediately be determined or is not responsive and human health/environment is threatened.

Initial abatement actions will at a minimum include removing the remaining contents of the UST, removing contaminated soil, removing free product from the surface water and groundwater, and the immediate mitigation of any fire, health and safety hazards. The DEM will also require that any UST from which a release has been confirmed be closed in accordance with section 15.00 of the **UST Regulations**. The time frame for tank closure will be decided by DEM and shall not exceed 180 days as required in section 15.02(A) of the **UST Regulations**. The DEM may require that other initial abatement actions or the responsible party depending on the specifics of the release take emergency procedures.

2.2 Release Characterization Report

General Requirements

Section 14.07 of the **UST Regulations** requires that within seven (7) days of a confirmed release from a UST, a release characterization report be submitted to the DEM by the owner/operator of the UST facility. The requirements of a release characterization report are detailed in section 14.07 of the **UST Regulations**. This report should be directed to the Office of Waste Management/Underground Storage Tank Management Program.

Exemption to the requirement to submit a Release Characterization Report

Often, the release is discovered during a tank closure. In this case, the closure assessment report should be written to include Section 14.07 and will serve as the release report. Therefore, a separate Release Characterization Report is not necessary.

Review of the Release Characterization Report

Once received, the assigned project manager reviews the release characterization report and any of the following actions may be required if not already done:

- Any necessary initial abatement actions such as described in section 14.05 of the **UST Regulations**.
- Contaminated soil excavation and/or free product removal in accordance with section 14.06 of the **UST Regulations**.
- The performance of a site investigation in accordance with sections 14.08 through 14.10 of the **UST Regulations**.

2.3 Waiver of Site Investigation Report

If the DEM determines that based on the release characterization report/closure assessment report and/or initial abatement action already taken that no free product is present, no contaminated soils are present, and there is no present or potential for surface water or groundwater impact, no further action will be required. Under these conditions, Section 14.08(A) of the **UST Regulations** allows the DEM to waive the requirement that a site investigation be performed.

3.0 Underground Storage Tank Closure

3.1 UST Closure Application

An application for UST closure must be completed and submitted to the Underground Storage Tank Program in accordance with section 15.06 of the **UST Regulations**, at least ten (10) business days prior to the proposed date of UST closure. The application and attached instructions are available from the Office of Waste Management. The tank owner and a representative of the local fire department must sign the application. A copy of this application is included as Appendix II.

3.2 UST Closure Application Review and Approval

Once received, the UST Closure Application is reviewed for completeness and conformance with the **UST Regulations** and conformance with the instructions. Once any missing or inaccurate information is corrected, the Department approves the application. A representative

of the UST staff will contact the applicant to schedule a specific date for the approved tank closure. Additionally, a letter is sent from the Department to the tank owner approving the tank closure in strict accordance with the information previously submitted in the UST Closure Application. A copy of the approval letter is also sent to the contractor for use with transportation and disposal of the UST(s).

If a UST Closure Assessment is required, a registered professional engineer or certified professional geologist who will be the responsible for the preparation of the UST Closure Assessment Report must be identified in section VI of the UST Closure Application. If the consultant is not a registered professional engineer or certified professional geologist, a statement of qualifications must be submitted to the Department for review and approval prior to UST Closure Application approval.

3.3 Closure Assessment

Prior to the tank closure, the owner/operator of the UST must also make provisions to have a closure assessment performed for tanks storing the following materials:

- Gasoline or diesel.
- Heating oil when the oil is not consumed entirely on site, e.g. transported off-site.
- Hazardous materials, waste oils, jet fuels and aviation fuel.

This information is required in the UST Closure Application prior to approval.

The Department may also require the performance of a closure assessment on any tank in which there is evidence that a leak or release has occurred, even if this tank is considered exempt from this requirement based on the tank contents.

Specific information regarding the UST Closure Assessment Report is detailed in the *UST Closure Assessment Guidelines*.

Exemption to Closure Assessment Requirement

Closure assessments are not required to be performed during closures of tanks storing the materials:

- USTs storing heating oils consumed solely on-site.
- Farm and residential motor fuel USTs of less than 1,100 gallons of capacity consumed solely on-site.

3.4 Closure in Place

Ordinarily, underground storage tanks are required to be closed by excavation and removal. Unless otherwise applied for and approved by the Department, this is the method that the DEM

assumes will be used to close the UST when the closure application is approved.

However, a tank may be approved by the Department to be "closed in place" based on considerations such as a threat to the structural integrity of a building or other permanent structure, sensitive/critical underground utilities, or safety of personnel. Consideration may also be given to economic impact of an impounded or inaccessible UST.

The closure in place of a UST is subject to prior Department approval on a site-specific basis. Additionally, closure in place of a UST is subject to section 15.12 of the UST Regulations and the Department Closure in Place ("CIP") Policy. A copy of the Closure in Place Policy has been included in Appendix III.

3.5 Scheduling

As stated in the tank closure approval letter, the morning of the scheduled tank closure, the tank owner/operator or contractor should contact the UST representative for confirmation. At the discretion of the Department, the tank closure may be inspected, particularly in those cases where a closure assessment report is not required. The Department representative may arrange for a specific time of inspection in which case the contractor will be notified during the confirmation call. The Department may also randomly inspect any UST closure subject to the **UST Regulations**.

3.6 Additional actions which may be required during the tank closure

The DEM representative may require the following actions to be taken in response to conditions identified during the tank closure:

- The performance of a closure assessment if not already required by the **UST Regulations**.
- The collection and laboratory analysis of soil samples in and around the UST and associated components in accordance with Appendix I.
- The excavation and stockpiling of contaminated soils in and around the UST and associated components (soil removal beyond, which is necessary to remove tank).
- The collection and laboratory analysis of post excavation soil samples in accordance with Appendix I.
- The removal of separate phase product from the water table by means of sorbent materials, use of a vacuum truck, or other approved method.
- The installation and sampling of groundwater monitoring wells.
- The submission of a site investigation report where obvious impacts to surface or groundwater, basements of structures, underground utilities have already occurred as a result of the release.
- Any other remedial activities as applicable under section 14.00 of the **UST Regulations** and the Oil Pollution Control Regulations.

The attempt is made at the time of closure to remove separate phase product and contaminated

soils if present to the extent practical, prior to backfilling of the tank grave. These actions are considered to be initial abatement as described in section 14.05 of the **UST Regulations**. As such, additional investigatory/remedial action may also be required after the completion of the tank closure.

3.7 Soil Excavation During Tank Closure

In any underground storage tank closure, soil is required to be excavated from above and most often alongside the tank prior to its removal. During this excavation, the soil should be field screened for volatile organic vapors using a field instrument such as a photo-ionization detector (PID) or flame ionization detector (FID), using the jar headspace technique.

Criteria for on site reuse of excavated soil

The following criteria is to be used in separation of the contaminated soil for offsite disposal and soil which may be reused onsite as tank grave backfill:

CRITERIA (PID OR FID, JAR HEADSPACE)

| | |
|---------------------|--------|
| GA/GAA Groundwater: | 20 ppm |
| GB Groundwater: | 40 ppm |

Additional Contaminated Soil Excavation during tank closure

The DEM encourages contaminated soil excavations (beyond what is required to removed the tank) where practical because it is often the most efficient technique of source removal, especially during a tank closure. If successful, the removal of the contaminated soil may eliminate the need to perform a site investigation and remedial action (i.e. contamination may be limited to the adsorbed phase). Field screening instruments should be used during this excavation; however, confirmatory soil samples may be required to be taken at the limits of the excavation and laboratory analyzed in accordance with Appendix I.

The extent to which contaminated soil is removed during tank closure (beyond which is required to lift the tank) is based on, but not limited to the following considerations: the extent and severity of the release if known, groundwater depth, use and classification, presence of human or ecological receptors, worker safety, the presence of permanent structures such as buildings and utilities, and property ownership limitations. This information is usually limited at the time of closure; therefore, the requirements are site specific and often arrived at through a consensus with the environmental consultant, contractor and the DEM representative.

3.8 Contaminated Soil Management

Soils exhibiting contaminant levels greater than the re-use criteria must be managed in accordance with the RIDEM “Oil Pollution Control Regulations” (DEM, December 1990 or

subsequent revisions) and the “Solid Waste Regulation No. 1 – General Requirements” (DEM, January 1997 or subsequent revisions). Petroleum contaminated soil is categorized as "oil spill debris" and is by regulation required to be disposed of within thirty (30) days. Upon excavation, the contaminated soil pile must be stored on and completely covered by thick gauge polyethylene or similar impervious material to prevent runoff and/or leachate, and to control odors. Documentation in the form of a receipt of the final disposal must be included in the closure assessment. Also, copies of the results of any laboratory analysis required for disposal must be included in the appendices of the Closure Assessment Report (if one is required).

All petroleum-contaminated soil must either be handled in accordance with the Oil Pollution Control Regulations/Solid Waste Regulation No. 1 or be used as tank grave backfill (if the above criteria is met). Petroleum contaminated soil which meets the criteria for tank grave fill should not be interpreted as clean soil and therefore cannot be used as fill anywhere else onsite or offsite.

3.9 Underground Storage Tank Closure Assessments Reports

Purpose

The general purpose of a UST Closure Assessment Report is to document the details of the UST closure and more importantly to determine if a release from that UST has occurred. In some cases the closure assessment has been required for an exempted tank in response to a known or likely release. The UST Closure Assessment Report must be submitted within thirty (30) days of the actual tank closure unless a time extension is requested in writing and approved based on special circumstances. The UST Closure Assessment Report must be submitted to the Office of Waste Management, Underground Storage Tank Program.

Closure Assessment Professional Qualifications

Closure assessments must be performed by persons of appropriate professional qualifications as detailed in the UST Closure Assessment Guidelines. For further clarification, the environmental professional (in the field) performing the closure assessment does not have to be a registered professional. However, the fieldwork must be conducted under the supervision of the registered professional engineer, certified professional geologist or other approved environmental professional identified and approved in the UST Closure Application. Furthermore, the UST Closure Assessment Report must be signed by that registered environmental professional or other approved environmental professional identified in the UST Closure Application.

Contents

Closure assessments must be performed in accordance with section 15.10 of the **UST Regulations**. This section of the **UST Regulations** lists the minimum information relative to the tank and environment, which must be included in the assessment. Owners/operators and consultants should

also refer to the *UST Closure Assessment Guidelines* for more specific information regarding closure assessments (see Appendix I).

Closure Assessment Report Review

Once received, a DEM Representative reviews the closure assessment report. The DEM representative will review the UST Closure Assessment to insure that it contains all of the specific information of the closure, is accurate, and that it meets all of the requirements of the **UST Regulations** and UST Closure Assessment Guidelines. The closure assessment must contain a distinct conclusion as to whether or not a release has occurred and the recommendations relative to any further investigatory action.

Following the review of the UST Closure Assessment Report, the DEM representative will:

- Accept and file the report.
- Require additional information.
- Reject the report with specific reasons for rejection in writing and require modification or resubmission.

Actions following UST Closure

- A UST Certificate of Closure may be issued in accordance with section 15.13 of the **UST Regulations**.
- A Site Investigation Report may be required in accordance with sections 14.08 through 14.10 of the **UST Regulations**.

4.0 Site Investigation Report (SIR)

The submission of a Site Investigation Report is required in accordance with sections 14.08 through 14.10 of the **UST Regulations** when it has been determined that a release has or likely has occurred from the UST or associated components, if not waived in accordance with section 14.08(A). Section 14.08(A) allows the DEM to waive the requirement to perform a site investigation if it is determined that no free product is present, no contaminated soils are present, and there is no present or potential for surface or groundwater impact. The observations made during the tank closure along with the results of the closure assessment report/release characterization report and any other available information related to the release are used by the DEM representative in making the decision to require or waive the requirement to perform a site investigation.

4.1 Definition

A Site Investigation Report or SIR is required when there is a potential for groundwater to be contaminated as a result of a leaking tank or tank system.

4.2 Purpose

The purpose of a SIR is as stated in Section 14.09(A) of the **UST Regulations** "to define the nature and extent of contamination and identify threats to the public health and environment."

4.3 Determination to require a SIR

A DEM representative makes the determination of whether a SIR is required during the following circumstances:

- During a closure inspection, contaminated soil remains in the ground and cannot be physically removed;
- Review of a Release Characterization Report or a Closure Assessment Report indicates that contaminated soil or free product remains in the ground and may act as a source for groundwater contamination;
- A Site Assessment has been submitted to the Department and the results of this investigation indicate that groundwater and/or soil contamination is present; this type of report does not automatically replace a SIR since it may not include all the information required in Section 14.09 of the **UST Regulations**;
- Discovery and/or complaints of vapors in buildings and utilities as well as presence of petroleum products in surface water.

4.4 Deadline for Submission of a SIR

Once a determination has been made by a DEM representative that a SIR needs to be prepared, the responsible party is notified. Notification is in the form of a letter requiring that a SIR be submitted within 60 days from the date of the letter or within an alternate deadline pre-approved by DEM. Extensions to the SIR are granted if problems arise with the scheduling of the contractor, adverse weather conditions that will not allow drilling, delays in obtaining analytical sampling results, or other reasonable delays arise. If the SIR is not received in 60 days or an alternate DEM approved deadline, then a second SIR letter request is sent to the responsible party.

4.5 Required Information

A complete SIR shall include all information requested in Sections 14.08 and 14.09 of the **UST Regulations**. The following information should be included in the SIR: the site's location and a detailed site plan, present and past activities, ownership, compliance and leak detection results, hydrogeology, a description of the surrounding area, the groundwater and surface water classification of the site and surrounding the site, the location of surrounding public and private wells, the nature of contamination, a groundwater contour map, potential receptors, groundwater and soil analytical results, and any other factors that can contribute to an adequate site characterization. Conclusions and recommendations and signed statements from the owner/operator of the facility and the consultant representing the owner/operator are mandatory, and SIR reports are deemed

incomplete if this information is not included. Furthermore, the SIR must be prepared under the supervision of a professional engineer, certified professional geologist or a person of appropriate qualifications and relevant professional experience that is acceptable to the Director.

4.6 SIR Review

The SIR will be reviewed for completeness, accuracy of the investigation and comments if necessary. A letter will be sent to the responsible party if the SIR is incomplete or if DEM doesn't agree with the conclusions and recommendations. If the site assessment does not fulfill all the requirements of sections 14.08 and 14.09, then DEM will send a letter stating the deficiencies and asking the responsible party to provide additional information as required in article 14.10 in **UST Regulations**.

5.0 Actions That May Be Taken After the SIR Review

After review of the SIR, the following may occur:

5.1 Issuance of a no Further Action Letter

If groundwater analytical sampling results are below the numerical groundwater quality standards listed in the **Groundwater Regulations** for areas where groundwater is classified GAA/GA and below the **Urban Groundwater Policy** for areas where groundwater is classified GB, then the Department will issue a No Further Action (NFA) letter. This NFA letter states that the LUST Site is closed based on information provided to date.

5.2 Further Action is Required

If groundwater analytical sampling results are above the numerical groundwater quality standards for areas where groundwater is classified GA, GAA or GB, then several actions may take place depending on the severity of the contamination:

5.2.1 Petroleum Contamination of Groundwater is Limited in Degree and Extent

If the groundwater analytical data just exceeds the above-referenced groundwater quality standards, i.e., within the same order of magnitude, and no sensitive environmental receptors are present and/or affected (such as wells or surface bodies), then groundwater monitoring (quarterly sampling for one year) will be required. The collection of this data will help determine the seasonal variations in groundwater quality and whether increasing or decreasing trends are present.

If a decreasing trend is displayed after a year of sampling, the assumption will be made that natural attenuation is taking place. Groundwater monitoring will continue until the groundwater quality standards are achieved. However, if an asymptotic curve is reached after many years of sampling and the site is in compliance with the **UST Regulations**, then

the owner/operator may apply for a residual zone designation from the Groundwater Program at DEM. For all practical purposes the site has become a NFA site in the UST Management Program.

In the case of analytical results staying the same or increasing after a year of sampling, then a more aggressive response will be required from the owner/operator of the facility. Responses may include additional wells may be required, additional source removal may be needed or a limited Corrective Action Plan (CAP) will need to be developed for the site.

Limited CAP may include non-mechanical remediation systems: some additional remediation may take place after the SIR, and there is no need for a formal CAP. However, the Department should issue a letter of approval for the limited CAP.

5.2.2 Petroleum Contamination of Groundwater is Severe in Degree and Extent

If the groundwater analytical results are above the numerical groundwater quality standards by more than an order of magnitude, remedial action is required and a CAP should be prepared according to article 14.11 in **UST Regulations**.

6.0 Corrective Action Plan (CAP)

6.1 Submittal

The Department may require that a Corrective Action Plan be developed to address contaminated soils or groundwater and other related environmental or public health impacts (Sections 14.11 through 14.16 of the **UST Regulations**). The CAP must be prepared by a qualified professional and must be signed or stamped by a registered professional engineer or certified professional geologist.

The CAP must be submitted to the DEM for review and approval within the time frame required by the DEM. Typically this time frame is 60 to 90 days depending on the complexity of the site. An extension to the required time frame must be requested in writing, is for good cause and given written approval by the DEM.

The CAP may be submitted as one document or may be submitted first as a Conceptual CAP for Department comment and approval before development of the complete CAP. Submittal of a Conceptual CAP would be required in a time frame that would allow for Department review and approval of the Conceptual CAP and development and submission of the full CAP in the required time frame.

Responsible parties may begin cleanup activities before the CAP is approved provided:

- The DEM is notified before cleanup is initiated. This notification must be in writing and include the time work will be conducted.
- The responsible party complies with any conditions imposed by the Department.
- Any cleanup activities are incorporated into the CAP, as an addendum or

modification if necessary.

6.2 Contents of CAP

A Corrective Action Plan must at a minimum include the following:

- A summary of the findings from the SIR and any additional information required by the DEM. This summary must include information on impacts and potential impact to all possible receptors must be provided, including but not limited to groundwater, surface water, public and private wells, environmentally sensitive areas, human exposure in nearby residences and commercial buildings. All supporting data pertinent to assessing the impacts must be summarized. This includes but is not limited to results of testing of all environmental media including soil, water and air, site hydrogeology, site geology, etc. Implementation of the CAP must result in protection of human health and safety and the environment and must restore or protect current and reasonable future uses of groundwater and surface water.
- A detailed description of the proposed remedial method, including but not limited to:
 - Justification that the proposed remediation will effectively meet the remedial objectives;
 - Design standards and technical specifications for the equipment and procedures of the proposed remediation;
 - Diagrams of piping routes, instrumentation and process flows;
 - Plans for the disposal of any products or by-products of the remediation activities.
- A proposed schedule for implementation of all remedial actions in the CAP.
- A proposed groundwater monitoring plan including monitor wells to be sampled including justification that the monitor well network will effectively monitor site conditions, frequency of sampling, analyses to be conducted and identification of target compounds and monitor well gauging.

Proposal for submission of status reports:

- Frequency of submission - the reporting period is typically quarterly but may be monthly depending on the sensitivity of the impacts of site contamination.
- All data generated during the time period covered, interpretation of the data, any conclusions and recommendations.
- Reports must be submitted within 45 days of the end of the reporting period. Extensions to this requirement must be requested in writing and approval given in writing.

6.3 Corrective Actions

The DEM will accept as proposals both conventional and alternative corrective actions or cleanup technologies. Sufficient information must be provided to support the effectiveness of the proposed remedial action(s).

Remedial actions include but are not limited to:

- Free product removal
 - Active methods such as pumping.
 - Passive methods such as scavenging or absorbing.
- Excavation and disposal of contaminated soil
- Vacuum extraction of soil (SVE) or groundwater or both (total fluid vacuum extraction)
- Air sparging in conjunction with SVE
- Bioslurping
- Pumping and treatment of groundwater. Treatment may be by air stripping, carbon absorption, ultraviolet/peroxide, etc.
- Enhanced biodegradation by addition of oxygen and nutrients to soil, groundwater or both.
- Natural Attenuation (see Appendix IV)
- Alternative Technologies.

6.4 Review of CAP

The DEM representative assigned as Project Manager for the site will conduct review of the proposed CAP. The review will be conducted within a reasonable time frame, typically 30 to 60 days depending on the complexity of the site. The CAP will be reviewed for completeness to insure that all required information is provided. The CAP will be reviewed for technical soundness of the proposed corrective action. The DEM may require submission of additional information, which is necessary for complete review of the proposed CAP.

6.5 Approval of CAP

The DEM may approve, approve with conditions or reject a proposed CAP based upon criteria including but not limited to:

- The physical and chemical characteristics of the contaminants, including toxicity, persistence and potential for migration.
- The geology and hydrogeology of the site.
- The proximity, quality and current and potential future uses of nearby surface and groundwater and the potential effects of residual contamination.
- The effectiveness, technical feasibility and required remedial time frame of the proposed corrective action technology to achieve clean up criteria.

Order Of Approval

Upon approval of the CAP, the DEM shall issue an Order of Approval, which shall govern the implementation of the CAP. The Order of Approval shall include:

- Specific reference to the CAP;
- Time schedule for implementation including installation and start up;
- Contingencies for potential additional necessary actions or other necessary modifications;
- Schedule for groundwater monitoring;
- Schedule for system inspections;
- Schedule for submission of status reports;
- Any other reporting obligations to the Department such as system shutdown;
- Any other site-specific requirements.

The Order of Approval is recorded in the land evidence records of the city or town where the site is located. Copies shall be provided to the owner/operator, the town manager or mayor and the town or city council president.

An Interim Order of Approval may be granted if doubt remains regarding the effectiveness of the proposed corrective action. The Interim Order of Approval shall make defined performance based requirements and shall include all the elements of the Order of Approval given above. These may include pilot testing, system operation and monitoring for a limited evaluation period. Once sufficient information is submitted to the DEM, which supports the effectiveness of the selected corrective action, the DEM shall issue an Order of Approval.

6.6 Implementation of CAP

The CAP shall be implemented in strict accordance with the Order of Approval or the Interim Order of Approval. As site conditions require, modifications to the CAP may be submitted for review and approval by the DEM. If such modifications are approved, appropriate modifications to the Order of Approval shall be made by the DEM.

7.0 Clean-Up Criteria (Remedial Objectives)

Remedial objectives are based on impacts to groundwater. Contaminated soil is considered a source of groundwater contamination and contaminant concentrations in soil are evaluated based on their potential to impact groundwater. Removal of source soils is encouraged and often the only soil remediation required. Source soils that are not or cannot be removed are remediated in situ.

Groundwater clean up criteria shall be determined by the groundwater classification of the site (GAA, GA or GB) and any impacts contaminated groundwater may have on downgradient human or environmental receptors.

Numerical GA groundwater standards in the **Groundwater Regulations** apply where the groundwater classification is GA or GAA and the **Urban Groundwater Policy** shall apply where the groundwater classification is GB. Remedial objectives for contaminants in groundwater for which numerical standards are not available shall be determined based upon factors such as toxicity, potential for migration and possible impact to receptors. Stricter standards may be required, especially in GB areas, to protect specific receptors or routes of exposure that exist at the site but were not considered during the calculation of the numerical standards.

If contaminated groundwater discharges to surface water, the standards in the “Water Quality Regulations” (DEM, August 1997 or subsequent revisions) apply. If numerical standards do not exist input from the Office of Water Resources may be requested. Hydraulic control or groundwater remediation may be necessary.

8.0 Site Closure

8.1 Compliance Determination

LUST sites are closed when the concentrations of contaminants in groundwater are all at or below the standards for the groundwater classification. Sites whose classification is GA must meet the numerical standards in the **Groundwater Regulations**. Sites whose classification is GB must meet the numerical standards in the **Urban Groundwater Policy** and the MTBE standard in the “Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases” (DEM, amended August 1996 or subsequent revisions).

Sampling results from an appropriate network of monitor wells are used to determine site compliance, which is achieved when the appropriate standards are achieved in all seasonal water table conditions. Generally, points of compliance refers to all groundwater monitoring wells onsite and offsite found to have been impacted by the release of a UST system. The duration and frequency of the sampling required to assure compliance with standards shall be defined by the DEM. Such sampling is usually required quarterly for a period of one or two years with all results at or below standards. Monitor wells, which have shown compliant concentrations for an acceptable period of time, may be eliminated from the list of monitor wells with continued monitoring requirements. Once all of the monitor wells required to be sampled for compliance determination have met the appropriate standards for the appropriate time frame, the site can be closed.

In the case where slight exceedances of groundwater standards persists on site after a reasonable period of remediation, whether active or natural attenuation, the Department may close the site under certain conditions:

- The exceedance of standards is only allowed in onsite wells. The points of compliance, where standards that apply to the groundwater classification must be met, include all site boundary or property line monitor wells.
- There are no drinking water wells or other sensitive receptors within 500 feet of the site’s property boundary.

- Every reasonable effort by currently available technology has been made to reduce contaminant concentrations. Cost may be considered as a factor in determining reasonable effort.
- The expectation is that contaminant concentrations will with time to compliance with the groundwater standards.

In the case where a significant exceedance of groundwater standards persists due to technical infeasibility or other site-specific limitations, the Department may allow the site to be closed after the owner applies for and receives a change in groundwater classification or a variance to the groundwater regulations.

8.2 Risk-Based Decision Making

In accordance with the **Groundwater Regulations**, the goal for contaminated groundwater is restoration to the groundwater quality consistent with the standards for the applicable class of groundwater. While the LUST Program has not adopted RBCA, risk-based decision-making is an integral part of the program. The numerical standards are based on risk and additional site-specific risk factors may need to be considered in determination of appropriate cleanup goals. The **Urban Groundwater Policy**, which is applied to groundwater in GB areas, was developed by modeling the risk scenario of human exposure to vapor in basements. Risk to a variety of possible human and environmental receptors is evaluated based on site-specific considerations to determine whether the numerical standards based on groundwater classification are appropriate.

The priority of LUST sites is ranked based on the risk to human health and the environment based on the following criteria:

- Immediate Action (HIGH PRIORITY)
- Everyday Routine Sites which include most of our sites (MEDIUM PRIORITY)
- Limited Action and Closed Sites (LOW PRIORITY)

| Site Classification | Criteria and prescribed scenarios | Response Action |
|---------------------|--|--|
| HIGH PRIORITY | <ul style="list-style-type: none"> * Explosive levels or concentrations of vapors that could cause acute health effects, are present in residence or other building * Explosive levels of vapors are present in subsurface utility system(s), but no building or residences are impacted * There is potential for explosive levels, or concentrations of vapors that could cause acute effects, to accumulate in a residence or other building * Free product is present in significant quantities at ground surface, on groundwater classified GA-GAA, on surface water bodies, in utilities other than water supply lines, or in surface water runoff * An active public water supply, public water supply line, or public surface water reservoir is impacted or immediately threatened * Ambient vapor/particulate concentrations exceed concentrations of concern from an acute or safety viewpoint | The appropriate abatement actions are taken to protect the public and the environment from these immediate threats such as: evacuate buildings, install venting systems in basements, recover free product, notify water suppliers and/or utility companies, install water filters in affected homes and businesses, install booms in surface waters, etc. |
| MEDIUM PRIORITY | <ul style="list-style-type: none"> * Groundwater is impacted, and a public or private supply well producing from the impacted aquifer is located downgradient of the known extent of chemical(s) of concern * Impacted surface water, storm water, or groundwater discharges into a sensitive habitat or surface water body * Soils are significantly impacted * Non-potable aquifer with no existing local use impacted * A non-potable water supply well [irrigation well] is impacted or immediately threatened * Free product is present on GB-classified groundwater | On these routine sites, the responsible party needs to follow the requirements in the UST Regulations . The project manager at DEM makes specific decisions and works with the responsible party in regards to compliance with the UST Regulations . |
| LOW PRIORITY | <ul style="list-style-type: none"> * Inactive sites where investigation or a limited cleanup is completed. Also, sites with minor exceedances of groundwater quality standards. | Examples include soil removal only, monitoring only (natural attenuation) or no further action sites. |

8.3 No Further Action

The DEM shall provide a “No further Action” letter when a site has been determined to be compliant with all remedial goals. This letter shall:

- Be sent by certified mail to the contact person for the responsible party.
- Be signed by the Supervising Engineer of the UST Management Program.
- Be copied to the DEM Project Manager, to representatives of other DEM programs involved with the site (such as RIPDES or Air Resources).
- List and summarize the reports and documents, which were reviewed and determined to provide information supporting the NFA decision.
- State that based upon the representations made by the responsible party and its consultant, the Department is requiring No Further Action.
- Clearly describe the location and extent of contamination remaining onsite, in the case where contamination is left on the site at concentrations above remedial objectives due to physical constraints, technological constraints or other reasons acceptable to the DEM. The specific reason must be clearly stated. This information can be provided in the text of the letter or by reference to an appropriate document.
- State that the DEM reserves the right to require additional investigation and/or remedial action if in the future significant contamination attributable to the site is discovered or if the land use changes.
- State, if necessary, that if excavation is done at the site in the future in the vicinity of the release, any contaminated soil encountered must be managed in accordance with the Oil Pollution Regulations.
- Require closure of some or all of the monitor wells in accordance with the Groundwater Regulations, if necessary.

9.0 Enforcement

9.1 Informal Enforcement

LOR – The first level of informal enforcement in response to non-compliance at a facility is the Letter of Responsibility (LOR). Prepared by the project manager, the letter states the regulations that have been violated, what actions and/or submittals are required within defined deadlines and warns that failure to comply will lead to formal enforcement action with penalties. These “non-legal” letters are issued for non-compliance such as overdue soil removal, closure assessments, site investigation reports or corrective action plans, for failure to perform required investigatory or remedial actions, etc.

NOI – If an inadequate response is received to the LOR, the project manager prepares a Notice of Intent to Enforce (NOI), which is more strongly worded and resembles the format of the formal enforcement document, the Notice of Violation (NOV). The NOI lists the facts supporting the

enforcement action, lists the violations, states the actions required to attain compliance and warns that failure to comply will result in issuance of an NOV and penalty.

If compliance with the NOI is not achieved, the case is referred to DEM's Office of Compliance and Inspection (OCI), which is the office responsible for issuing formal enforcement actions.

9.2 Formal Enforcement

NOV – Once a facility is referred, OCI, working with the Office of Legal Services, is responsible for all administrative and legal actions concerning the case; OWM maintains responsibility for all technical aspects. OCI issues NOV's, negotiates Consent Agreements and presents cases to administrative hearings and to court.

ICO – The Immediate Compliance Order (ICO) is a legal document whose purpose is to notify a responsible party that there is an immediate threat to the public health, safety, welfare and/or environment, and that immediate action is required to reduce or eliminate the threat. OWM prepares and issues ICO's because the project managers' familiarity with their own sites allows for the quick preparation and issuance necessary in response to the immediate threat. Failure to comply with an ICO will result in DEM's Office of Legal Services filing a complaint with Superior Court to enforce the ICO.

Leo Hellested, P.E.
Chief, Office of Waste Management
Rhode Island Department of Environmental Management

Effective Date

APPENDIX I -UST Closure Assessment Guidelines (DEM, October 1998)

APPENDIX II – Permanent Closure Application for Underground Storage Tank(s)

APPENDIX III – Closure in Place (CIP) Policy (RIDEM, June 1998)

APPENDIX IV – Natural Attenuation

Natural Attenuation

The goal of the LUST Program is to protect the waters of the state from contamination from the underground storage of petroleum products and hazardous materials. In determining investigatory and remedial requirements and site cleanup goals, the Department considers impacts and potential impacts to human health and the environment. There are a variety of remedial alternatives that involve different degrees of active and passive components and different associated monitoring requirements.

Natural Attenuation is the reduction of concentrations of contaminants in soil and groundwater that occurs in the environment by a variety of natural physical, chemical and biological processes. Biodegradation by indigenous microbial populations is a major contributor to the natural attenuation of petroleum. Other processes important in the attenuation of petroleum hydrocarbons include dispersion, dilution, sorption and volatilization.

The Department does consider natural attenuation an appropriate remedial approach for the contaminated groundwater under the following conditions:

- The source must have been removed or actively remediated. Natural attenuation is expected to continue reducing contaminant concentrations in any residual source material that may remain.
- Natural processes must be capable of attenuating concentrations of the contaminants in a reasonable period of time. This is generally true for petroleum.
- There must be no significant impact or threat to human and environmental receptors.
- The plume of contaminated groundwater must be stable or shrinking. The monitor well network must include enough wells that have been sampled for a long enough time period to ensure the plume is not expanding.
- Monitor well sampling results must indicate that natural attenuation is occurring. This includes contaminant reduction and/or chemical indicators such as dissolved oxygen.
- Monitoring of the groundwater must continue quarterly (or at an alternate site-specific frequency required by the Department) throughout the period of remediation by natural attenuation.

Natural attenuation may be the only remedial approach at a release site if a period of monitoring during or subsequent to the site investigation provides information that satisfies the above conditions. Natural attenuation also may be used after active groundwater remediation has been terminated due to decreased remedial effectiveness or cost effectiveness.

APPENDIX E

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT UST CLOSURE ASSESSMENT GUIDELINES

October 1998

The following UST Closure Assessment Guidelines supersede the original guidelines effective July 21, 1992. These guidelines are intended to assist the UST facility owners/operators and their consultants in complying with Section 15.10 of the RIDEM REGULATIONS FOR UNDERGROUND STORAGE FACILITIES USED FOR PETROLEUM PRODUCTS AND HAZARDOUS MATERIALS.

Which USTs are subject to closure assessments?

As specified in Section 15.01 of the state UST regulations, not all UST facilities must perform assessments. In general, preparing an assessment report is mandatory when tanks storing the following types of materials are closed:

- * Gasoline or Diesel
- * Heating Oil when the oil is not consumed entirely on-site, e.g. transported off-site.
- * Hazardous Materials
- * Waste Oils
- * Jet Fuels & Aviation Gas
- * Lubricating and Cutting Oils

The following facilities are exempt from the mandatory closure assessment requirements:

- * USTs storing heating oils consumed on-site.
- * Farm/residential motor fuel tanks of less than 1,100 gallons of capacity consumed solely on-site.

Please note however, that DEM may require an assessment at any exempted facility if there are conditions which indicate a possible leak or release has occurred. When a release is discovered during a tank closure, Section 14.00 of the UST Regulations (Leak and Spill Response) is applicable. When a DEM representative is present during the tank closure and a closure assessment is performed, a separate release characterization report in accordance with Section 14.07 of the UST Regulations is not required.

Who performs the assessment?

The facility owner/operator is required to make arrangements (e.g. retain consultants) to ensure an adequate closure assessment is performed. Assessments must be carried out by persons of appropriate professional qualifications and be employed by a firm independent of the UST facility owner. In general, DEM will consider that registered professional engineers (civil, environmental, and chemical) and certified professional geologists have the appropriate level of training and expertise to supervise the preparation and interpretation of a closure assessment report. A person of other qualifications must submit a statement of qualification to the DEM prior to conducting a closure assessment and receive written approval to proceed. The statement of qualification must detail education, additional training and relevant experience.

Field activities during a closure assessment may be carried out by other qualified persons provided that the final assessment report is reviewed and attested to by a qualified professional. The environmental professional performing the closure assessment must have all the appropriate equipment such as soil screening instruments, sampling jars, gloves, camera, etc. and demonstrate the ability to use this field equipment in a proper manner. DEM will not approve assessments prepared by persons who fail to demonstrate to DEM they possess the necessary education, training, and experience to be able to conduct the assessment and interpret the results in an accurate and valid manner. Additionally, the environmental professional performing the closure assessment must be on site during all soil excavation, tank cleaning and lifting, contaminated soil excavation, etc. The consultant is not required to be present during initial preparatory work such as pavement removal, pump and island removal, etc. or backfilling of the tank grave.

What has to be done to complete the assessment?

The goal of any closure assessment is to determine if a leak or release from the UST system has occurred. This is done by measuring for potential releases from the UST system in locations at which releases would most likely occur. In addition, a proper assessment makes use of all readily available and pertinent information for the site, including background information on leak detection. The results of the closure assessment must be submitted to DEM in a written report format.

Contents of the Closure Assessment:

1. Background description of the site: location, use of facility, etc., and summary of leak detection results where available. Include a detailed diagram of the site showing location of removed tank(s), pump(s), lines, buildings, monitoring wells, locations of soil screening and sampling, and other pertinent site features.
2. Description of the closure actions taken, e.g. number, size, construction type and stored material of USTs closed. Include a brief description of closure method including final deposition of

the tanks and any wastes generated by tank cleaning operations. Discrepancies between information contained on the original application form and that gained during the actual closure should be explained and clarified. For example, often times the sizes and materials stored in USTs are different than what was originally presumed. Copies of manifests generated for the site should be included in the closure assessment report.

3. Description of the condition of each tank removed or closed. Including the extent of corrosion and presence of holes in the tank or piping. Describe the conditions of piping/tank connections. This may require that compacted soils be removed from the tank prior to a visual inspection. A photograph documenting the condition of each removed UST is required.

4. Description of the soil conditions in and surrounding the UST system excavation. Including soil types, gradation (where applicable), extent of compaction and any other notable physical characteristics. The soil classification system used to describe the soil must be stated in the closure assessment.

5. Description of soil conditions relative to contamination with petroleum products or hazardous materials. The quality of the soils must be assessed by field or analytical sampling methods in several locations throughout the excavation area. Field screening instruments such as the photo-ionization detector (PID) or the flame ionization detector (FID) may be used at sites with USTs used to store gasoline, diesel and #2 fuel oil. A standard operating procedure, documentation of calibration of field equipment shall be made available to the DEM inspector on request and must be included in the closure assessment report. The use of a PID to screen soils for heavier petroleum products is not appropriate.

At a minimum, soil samples must be taken from the following specific locations and screened for the presence of contamination:

| | |
|--------------|--|
| Sidewalls: | Five-foot intervals at elevation equal to tank center |
| Lines: | Dispensary and remote fill lines at five-foot intervals |
| Pump island: | At five-foot intervals |
| Fill pipe: | From grade to top of tank and along tank sides at fill end |
| Tank bottom: | Along centerline according to length of tank: |

| | |
|-----------------------|--|
| Less than 6 feet: | One soil sample at tank center |
| 6 feet to 12 feet: | One soil sample at each end |
| 12 feet + to 20 feet: | One soil sample at each end and one at tank center |
| Greater than 20 feet: | One soil sample every five feet along centerline |

Additional soil screening is to be done in areas where leaks are apparent.

All of the soil screening results from the sidewalls, tank bottom, lines, pump island and fill pipe are to be recorded and tabulated in the closure assessment report.

When a release is observed during the tank closure, the Department must be notified. See the "Release Notification" section of these guidelines.

6. Description of the presence of groundwater at the site, including the distance between the tank bottom and the groundwater table. Depth to the water table shall be noted where encountered. Also describe the quality of groundwater based on visual and field screening observation methods and, where appropriate, laboratory analysis of water samples. The presence of any sheen or amount of free product shall be noted. Additional actions pertaining to free product are contained in Section 14.00 of the UST Regulations. During excavation an attempt to reach the groundwater table shall be made. The reach of the backhoe is considered the acceptable limit of this excavation effort. If groundwater-monitoring wells are present, they should be gauged for the depth to groundwater and for the presence of free product.

7. All soil and water samples should be collected and handled according to proper chain of custody requirements and accepted sampling protocols. With the report, documentation of chain of custody and adherence to appropriate quality control and quality assurance measures shall be provided. Samples must be analyzed at laboratories approved by the State of Rhode Island, or if located out of state, approved by the appropriate regulatory entity in that jurisdiction.

8. For sites located in the wellhead protection areas of community wells and non-transient non-community wells, as designated by DEM, samples of the groundwater at the site are mandatory, unless the requirement is waived by the DEM representative.

9. Include identification of the groundwater classification for the site and surrounding area and characterize the use of groundwater resources in the site vicinity; e.g. private wells are in use nearby. The groundwater classification shall be considered by DEM in decisions regarding the extent of soil removal and/or other remedial efforts to be undertaken at the site.

10. If contamination is identified on the site, note any other receptors, e.g. private wells, surface waters, storm drains, basements, which may be affected. Receptors should be evaluated to the extent feasible for indications of a release.

11. Findings and Conclusions: The closure assessment report must include a finding as to whether or not a release has or is likely to have occurred and caused contamination of the environment. It is the responsibility of the professional writing the report to clearly make this conclusion.

Information such as depth to groundwater, soil type, soil screening and laboratory analytical results,

etc. should be used in making this conclusion. Laboratory analytical results of any soil samples taken during the tank closure may be compared to the Leachability Criteria listed in Table Two of these guidelines. When the results of the closure assessment indicate that groundwater has or likely has been impacted by a release, a site investigation in accordance with Sections 14.08 through 14.10 of the UST Regulations should be recommended.

It is not necessary in this report to characterize the full extent of any significant contamination found during the closure process since such sites will be expected to proceed pursuant to Section 14.00 of the UST Regulations (Leak & Spill Response), to conduct a full site assessment/investigation.

The closure assessment shall include recommendations for further action, where necessary. If no further action is required, it must be clearly stated in the report.

Release Notification

If contamination is observed visually or by field screening methods during the tank closure, the DEM Underground Storage Tank Program is to be notified immediately by telephone. A representative from the UST program will determine if additional action is needed during the tank closure such as contaminated soil excavation, laboratory analysis of soil samples, and other release response actions in accordance with Section 14.00 of the UST Regulations. When soil samples are required to be taken for laboratory analysis, the EPA methodology listed in Table 1 of these guidelines must be used.

NOTE: When using a PID or FID, the following criteria is to be used as the threshold for release reporting and to separate contaminated soil for offsite disposal from soil which may be reused onsite as tank grave backfill:

| | |
|---------------------|--------|
| GA/GAA Groundwater: | 20 ppm |
| GB Groundwater: | 40 ppm |

These numbers are not meant to show a site is clean, or in compliance with other regulations. They are a screening indicator to show that the material does not necessarily have to be managed at an offsite-licensed facility.

When is the closure assessment report due?

Closure assessment reports are due to DEM no later than 30 days following the closure. Additional time may be requested in writing if special circumstances warrant an extension.

What happens after the assessment is submitted?

DEM will review closure assessments to insure that they meet these guidelines and the revised state

UST regulations. Again, the goal of the assessment is to identify whether contaminants which are associated with the UST systems are present at the site. Following its review, DEM will either accept or reject the submitted assessment. Deficiencies in the rejected assessments will be noted and required to be corrected by the owner/operator.

Final certificates of closure will not be issued until the closure assessment is approved. If a release has occurred, the issuance of the closure certificate may be subject to additional requirements such as site investigation, site monitoring, or site remediation.

Terrence D. Gray, P.E.
Chief, Office of Waste Management

NOTE: These guidelines are subject to change. DEM will maintain a mailing list of firms doing business in this area, which would like to be notified when subsequent policies and/or guidelines are issued. To place your firm on the mailing list, call the UST Program at (401) 222-2797.

For more information contact:

**Department of Environmental Management
Office of Waste Management
Underground Storage Tank Management
235 Promenade Street
Providence, RI 02908**

**TEL (401) 222-2797
FAX (401) 222-3813
TDD (401) 831-5508**

TABLE ONE

SOIL SAMPLE ANALYSIS

The following EPA Methods are to be used when soil samples are required to be taken and laboratory analyzed during tank closure:

| <u>TANK CONTENT</u> | <u>EPA METHOD</u> |
|----------------------------|----------------------------|
| Gasoline | 8260 (& MTBE) VOCs |
| Mineral Spirits | TPH-8015(M) |
| JP-4 | 8260 VOCs |
| Kerosene | TPH-8015(M) or TPH-8100(M) |
| Jet A | TPH-8015(M) or TPH-8100(M) |
| JP-5 | TPH-8015(M) or TPH-8100(M) |
| Diesel | TPH-8100(M) |
| #2 Fuel Oil | TPH-8100(M) |
| #4 Fuel Oil | TPH-8100(M) |
| #5 Fuel Oil | TPH-8100(M) |
| #6 Fuel Oil | TPH-8100(M) |
| Lubricating Oil | TPH-8100(M) |
| Waste Oil* | TPH-8100(M) |

Refer to Environmental Protection Agency Document SW-846 “*Test Methods for Evaluating Solid Waste*” for the latest revisions, which must be used.

* A soil sample is required to be taken and laboratory analyzed during the closure of a waste oil tank. The required method to be used is 8100 Modified for total petroleum hydrocarbons.

When a release is observed from a waste oil tank, the soil must also be analyzed for volatile organic compounds using EPA Method 8260.

Other analyses may be required for tanks containing products other than those listed above.

TPH 8015(M)- or equivalent volatile "purge and trap", GC method

TPH 8100(M)- or equivalent extractable GC method

TABLE TWO
SOIL LEACHABILITY CRITERIA

| CONTAMINANT | GA (mg/Kg) | GB (mg/Kg) |
|-----------------------------|------------|------------|
| BENZENE | 0.2 | 4.3 |
| TOLUENE | 32 | 54 |
| ETHYLBENZENE | 27 | 62 |
| XYLENES | 540 | * |
| METHYL-TERTIARY-BUTYL-ETHER | 0.9 | 100 |
| NAPHTHALENE | 0.8 | * |
| DICHLOROETHANE (1,2-) | 0.1 | 2.3 |
| ETHYLENE DIBROMIDE | 5E-04 | * |

TOTAL PETROLEUM HYDROCARBON LEACHABILITY CRITERIA

GA GROUNDWATER CLASSIFICATION: 500 ppm

GB GROUNDWATER CLASSIFICATION: 2500 ppm

The above soil leachability criteria are from the RIDEM *Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases*.

* Soil leachability criteria not established for this contaminant

Electronic Copies of Appendices F-H are not available

APPENDIX F- Standard Guide for Installation of Direct Push Ground Water Monitoring Wells,
ASTM D6724-01 (January 2002)

APPENDIX G -Geoprobe Macro-Core Soil Sampler. Standard Operating Procedure. Technical
Bulletin No. 95-8500 (Revised September 1998)

APPENDIX H - Geoprobe® 1.0 in. x 2.5 in. OD and 1.5-in. x 2,5-in. OD Prepacked Screen
Monitoring Wells. Standard Operating Procedure. Technical Bulletin No.
992500 (Revised December 2002)